

What is claimed is:

1. A spherical particle of Fe-based metallic glass alloy prepared by an atomizing process, which has a particle size of 30 to 125  $\mu\text{m}$ , and a composition consisting of, by atomic %, 0.5 to 10 % of Ga, 7 to 15 % of P, 3 to 7 % of C, 3 to 7 % of B and 1 to 7 % of Si, with the remainder being Fe.

2. A bulk Fe-based sintered alloy soft magnetic material of metallic glass, which consists of a high-density metallic glass phase sintered body with a relative density of 99.0 % or more, prepared by sintering the plurality of spherical particles of Fe-based metallic glass alloy as defined in claim 1, and has a magnetic permeability of 3900 ( $\mu_{\text{max}}$ ) or more and a coercive force ( $H_c$ ) of 19 (A/m) or less in an as-sintered state, wherein said metallic glass has:

a temperature interval of a supercooled liquid region ( $\Delta T_x$ ) of 25 K or more, as expressed by the following formula:  $\Delta T_x = T_x - T_g$ , wherein  $T_x$  is a crystallization temperature, and  $T_g$  is a glass transition temperature; and

a reduced glass transition temperature of 0.59 or more, as expressed by the following formula:  $T_g / T_l$ , wherein  $T_g$  is a glass transition temperature, and  $T_l$  is a liquidus temperature.

3. A bulk Fe-based sintered alloy soft magnetic material of metallic glass, prepared by subjecting the bulk Fe-based sintered alloy soft magnetic material as defined in claim 2 to a heat treatment in a temperature range of 573 to 723 K, which has a magnetic permeability of 7000 ( $\mu_{\text{max}}$ ) or more and a coercive force ( $H_c$ ) of 12 (A/m) or less.

4. A method of producing a spherical particle of Fe-based metallic glass alloy, comprising:

melting an alloy having a composition consisting of, by atomic %, 0.5 to 10 % of Ga, 7 to 15 % of P, 3 to 7 % of C, 3 to 7 % of B and 1 to 7 % of Si, with the remainder being Fe;

dropping or ejecting said molten alloy from a nozzle; and

spraying high-speed gas to droplets of said molten alloy to rapidly solidify said droplets so as to obtain an alloy particle having an amorphous phase and a maximum particle

size of 30 to 125  $\mu\text{m}$ .

5. A method of producing the Fe-based sintered alloy soft magnetic material as defined in claim 2, comprising:

5 preparing a plurality of spherical particles of Fe-based metallic glass alloy having a particle size of 30 to 125  $\mu\text{m}$  by the method as defined in claim 4; and

sintering said spherical particles by a spark plasma sintering process under the conditions that: a heating rate is set at 40 K/min or more; a sintering temperature (T) is set in a temperature range satisfying a relationship of  $T \leq T_x$ , wherein  $T_x$  is a crystallization  
10 temperature; and a compression pressure is set at 200 MPa or more.

6. A method of producing the bulk Fe-based sintered alloy soft magnetic material of metallic glass as defined in claim 3, comprising:

preparing a Fe-based sintered alloy soft magnetic material by the method as defined in  
15 claim 5; and

subjecting said Fe-based sintered alloy soft magnetic material to a heat treatment in a temperature range of 573 to 723 K.